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(12) # EUROPEAN PATENT APPLICATION

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(54) **Tamper-evident closure.**

(57) The invention relates to a closure, comprising:

- a container with
  a sealing ring (8) shrunk by heating and gripping beneath the locking collar;
  a number of connections (9) in spread positions between the sealing ring and an inside lower edge zone of the screw cap;
  a protective edge (11) extending over at least a portion of the connections (9).

The invention proposes a closure of the stated type which displays the feature that each connection (9) comprises:
a bridge portion (12) moulded onto the sealing ring (8) on the top side and having radial and axial dimensions in the same order of magnitude as those of the sealing ring (8); and
a breaking portion (13) extending between that bridge portion (12) and the inside lower edge zone (10) of the screw cap (6) and having a smaller cross-sectional surface area than the bridge portion (12), which breaking portions (13) are covered off by the protective edge (11),
whereby, prior to the shrinking process and after the screwing of the screw cap (6) into position on the container the sealing ring (8) is situated on an axial position relative to the locking collar such that during shrinking of the sealing ring (8) under the influence of localised temporary heat supply the shrinking forces thereby occurring cause a tensile stress in the connections (9) such that the breaking portions (13) undergo a stretching with associated cross-sectional surface area reduction.

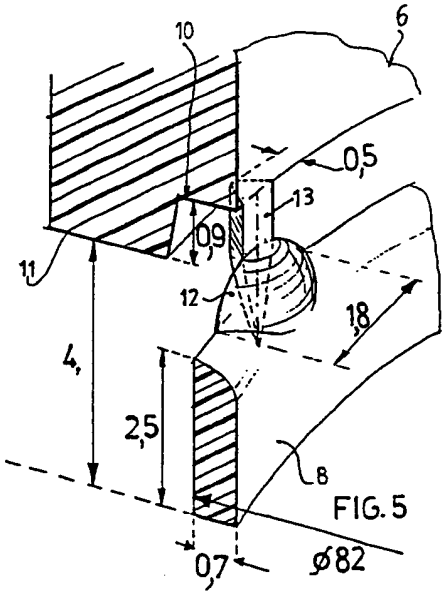

FIG. 5

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SAFETY CLOSURE

The invention relates to a closure, comprising:
- a container with
an opening;
a substantially cylindrical wall portion adjoining this opening;
at least one screw thread present on the outside thereof, and
a locking collar present on the side of this screw thread facing away from the opening;
- a plastic screw cap consisting of one whole and manufactured by injection moulding and having
internal screw thread for co-action with the thread present on the container;
a sealing ring shrunk by heating and gripping beneath the locking collar;
a number of connections in spread positions between the sealing ring and an inside lower edge zone of the screw cap;
a protective edge extending over at least a portion of the connections.

Such a closure is known in many embodiments. It is usual for the connections to consist of thin material bridges. These have the drawback that they shrink more rapidly than the sealing ring in the processing phase in which the sealing ring undergoes shortening through the application of heat. As a consequence the axial shortening of the material bridges can then become so great that the sealing ring is fused to the bottom edge of the screw cap. This makes it difficult for the consumer to break the sealing, while it can even occur that the sealing is not broken at all, thus enabling unauthorized opening.

The invention has for its object to embody a closure such that this drawback of the known art no longer occurs.

The invention further proposes to make it possible using existing heat treatment devices for performing of the shrinking process (for instance those which are used in the case of for example 28 mm MCA-closures of polyethylene) to embody a break-in proof closure in for instance polypropylene on wide-mouthed containers, that is, containers with an opening diameter from circa 43 mm of for instance glass or PET.

These and other objects are achieved according to the invention with a closure of the stated type which displays the feature that each connection comprises:
a bridge portion moulded onto the sealing ring on the top side and having radial and axial dimensions in the same order of magnitude as those of the sealing ring; and
a breaking portion extending between that bridge portion and the inside lower edge zone of the screw cap and having a smaller cross-sectional surface area than the bridge portion, which breaking portions are covered off by the protective edge, whereby, prior to the shrinking process and after the screwing of the screw cap into position on the container the sealing ring is situated on an axial position relative to the locking collar such that during shrinking of the sealing ring under the influence of localised temporary heat supply the shrinking forces thereby occurring cause a tensile stress in the connections such that the breaking portions undergo a stretching with associated cross-sectional surface area reduction.

Achieved with this configuration is that per corner part the heat capacity of the sealing ring and that of the bridge portions lies in the same order of magnitude. During the heat treatment the sealing ring shrinks tangentially and therefore radially, and the bridge portions shrink axially. Because the shrinkage of both is in the same order of magnitude it is not possible for the sealing ring to be shrunk fixedly against the lower edge zone of the screw cap.

Achieved as a result of the dimensioning and placing of the breaking portions is that only a part of the locally and temporarily applied heat reaches the thin breaking portions, which results in the sealing ring and the bridge portions being shrunk before the breaking portions melt, which would result in at least partial breakage of the sealing ring during the shrinkage process. A second advantage is that after opening of the container with breakage of the connections the sharp points left over from the breaking portions lie hidden behind the protective edge so that there need be no fear of risk of injury to the consumer. The breaking pieces and the sealing ring are placed inwardly relative to the lower edge zone of the screw cap. The breaking piece protrudes slightly outward. As a result the sealing ring lies comparatively close to the container, so that the heating time remains limited; because of this dimensioning the sealing ring has in any case to shrink less in order to come beneath the edge of the locking collar of the container. Because of this limited shrink time the thermal loading on the sealing ring is limited. A higher thermal loading could make the sealing ring brittle, with the result that it could break sooner than the breaking pieces. Such a manner of breaking gives a less clearly visible breakage of the sealing. This limited thermal loading also makes it possible to employ plastic containers, for instance of PET. Such containers could deform badly in the case of a too high thermal loading.

The portion with the largest diameter of the

locking collar lies approximately at the same position as the top side of the bridge portions without being in engagement therewith. As a result of this placing a screw cap can easily be placed on prior to the shrinking process and the sealing ring has space to shrink beneath the locking collar of the container.

The distribution of the connections over the periphery is partly determined by the diameter of the closure. When there is a comparatively large number of connections the force required to break the sealing is relatively great and there is the danger that an inadequate breakage will result. When there is a comparatively small number of connections the stability of the sealing ring is small during the heating which could cause a sagging of the ring when heating takes place and an insufficient sealing.

In preference the connections are placed relative to a multi-start screw thread of the screw cap such that the lowest end of the screw thread is situated between the connections. It is the case with a multi-start screw thread that the screw cap wall is constrained outward at the end of a thread, which would result in the sealing ring also being pulled outward if a connection were present at this position. This could cause a less good shrinkage under the locking collar.

Further features of the invention will now be stated and elucidated with reference to the annexed drawing, in which:

fig. 1 shows a container with a cover wherein the invention is incorporated;

fig. 2, 3 and 4 show three successive manufacturing phases of the closure according to fig. 1; and

fig. 5 shows on larger scale the detail V from fig. 1.

Fig. 1 shows a container 1 such as a jam jar. This container comprises an opening 2, a substantially cylindrical wall part 3 adjoining this opening and having a number of screw threads 4 and present thereunder an annular locking collar 5.

The container 1 can be closed by means of a cover or screw cap 6 which consists of a plastic and is manufactured as one whole by injection moulding. The cover 5 comprises internal screw thread 7 for co-action with the external screw threads 4 of container 1, a sealing ring 8 which serves for co-action with the locking collar 5, as will be further described later, a number of connections 9 placed distributed along the periphery between the sealing ring 8 and an inside lower edge zone 10 (see fig. 2-5) of the screw cap; an external protective edge 11 extending over a part of the connections 9 to be described later. The connections, being that part of the closure to which the invention relates, each comprise: a bridge portion 12 moulded onto the top side of the sealing ring 8 and having radial and axial dimensions in the same order of magnitude as those of the sealing ring 8; and a breaking portion 13 extending between that bridge portion 12 and the inside lower edge zone 10 of cover 8, which part 13 has a smaller cross-sectional surface area than bridge portion 12. The breaking portions 13 are covered off by the protective edge 11.

In the situation shown in fig. 1 the cover 5 still has to be screwed into place on the (in the meantime filled) container 1. After this has taken place the closure is located in the situation shown in fig. 2. In this position the screw threads 4 and 7 co-act with one another.

As a result of temporary and localised heat application, for instance with hot air, to the sealing ring 8, for instance a heat pulse of approximately 1 sec. at a temperature of roughly 300 °C, the sealing ring 8 is caused to shrink. Via the situation shown in fig. 3 the situation of fig. 4 is eventually reached in which the sealing ring 8 grips beneath the locking collar 5. As can be seen from the transition from fig. 2 to fig. 4 a stretching of the breaking portions 13 takes place through the shrinkage of the sealing ring 8. This stretching is of importance in ensuring that the breaking portions 13 can be broken with a smaller force. This aspect is of particular importance in the case of stronger plastics such as polypropylene.

Fig. 5 shows in more detail a number of features of this embodiment, to which the invention is not limited. Also indicated in this figure by way of example are several dimensions in mm. As can be seen from the figure, each breaking portion 13 also extends as a rib over at least a considerable part of the outer surface of the associated bridge portion 12.

Claims

1. Closure, comprising:
- a container with
an opening;
a substantially cylindrical wall portion adjoining this opening;
at least one screw thread present on the outside thereof, and
a locking collar present on the side of this screw thread facing away from the opening;
- a plastic screw cap consisting of one whole and manufactured by injection moulding and having
internal screw thread for co-action with the thread present on the container;
a sealing ring shrunk by heating and gripping beneath said locking collar;
a number of connections in spread positions be-

tween said sealing ring and an inside lower edge zone of said screw cap;
a protective edge extending over at least a portion of said connections;
characterized in that
each connection comprises:
a bridge portion moulded onto said sealing ring on the top side and having radial and axial dimensions in the same order of magnitude as those of said sealing ring; and
a breaking portion extending between that bridge portion and said inside lower edge zone of said screw cap and having a smaller cross-sectional surface area than said bridge portion, which breaking portions are covered off by said protective edge,
whereby, prior to the shrinking process and after the screwing of said screw cap into position on the container said sealing ring is situated on an axial position relative to said locking collar such that during shrinking of said sealing ring under the influence of localised temporary heat application the shrinking forces thereby occurring cause a tensile stress in said connections such that said breaking portions undergo a stretching with associated cross-sectional surface area reduction.

2. Closure as claimed in claim 1, **characterized in that** each breaking portion also extends over at least a considerable part of the outer surface of the associated bridge portion.

3. Screw cap evidently intended as part of a closure as claimed in any of the foregoing claims.

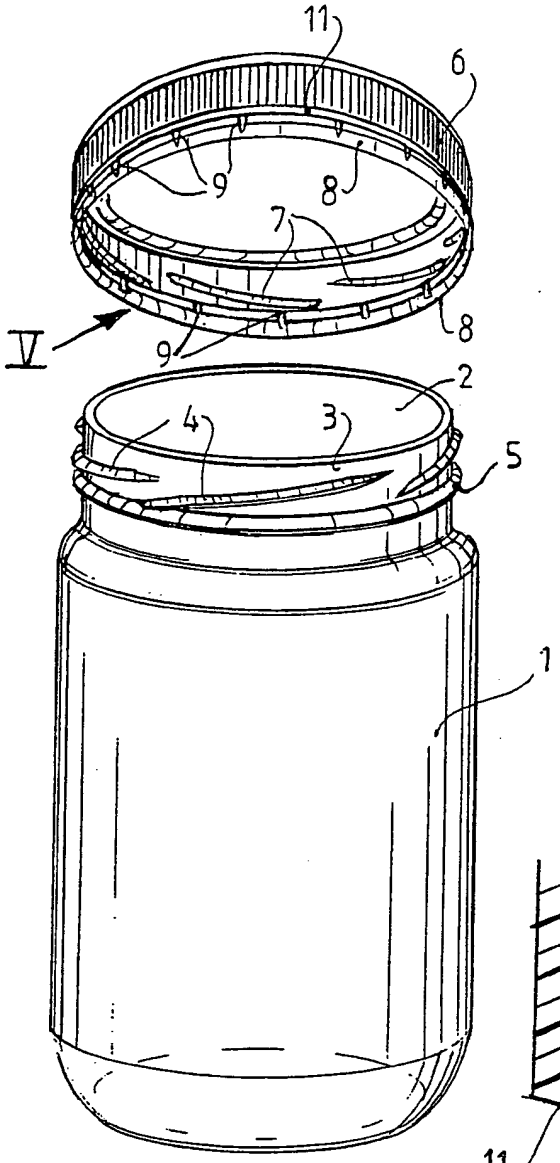

FIG. 1

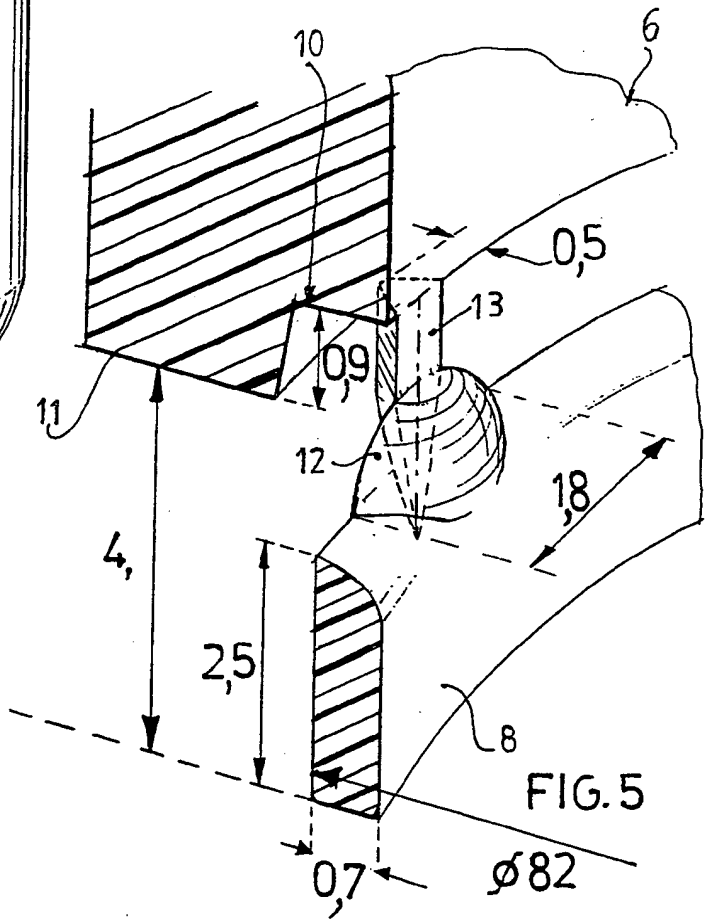

FIG. 5

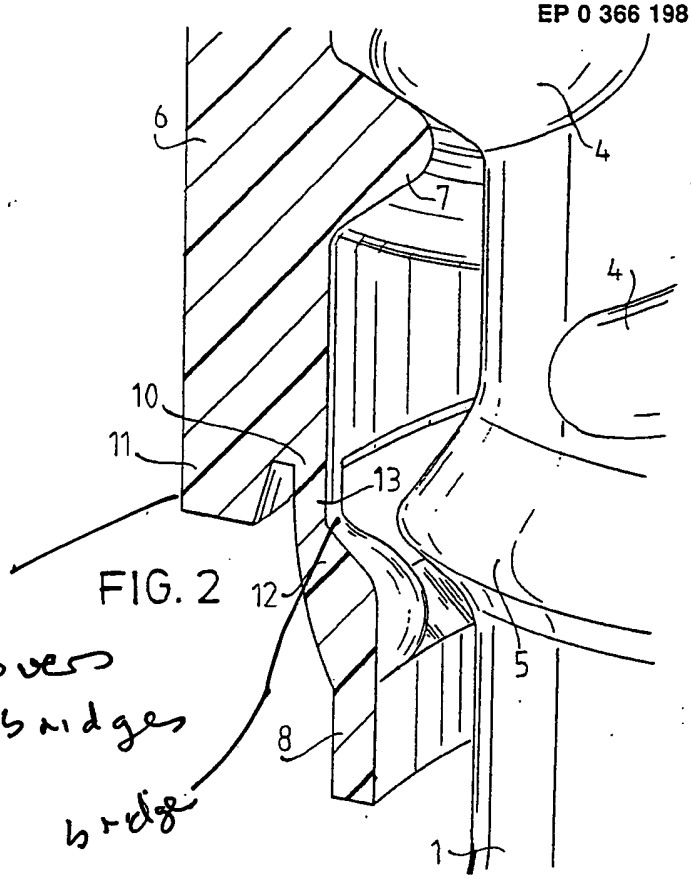

FIG. 2

covers
bridges
bridge

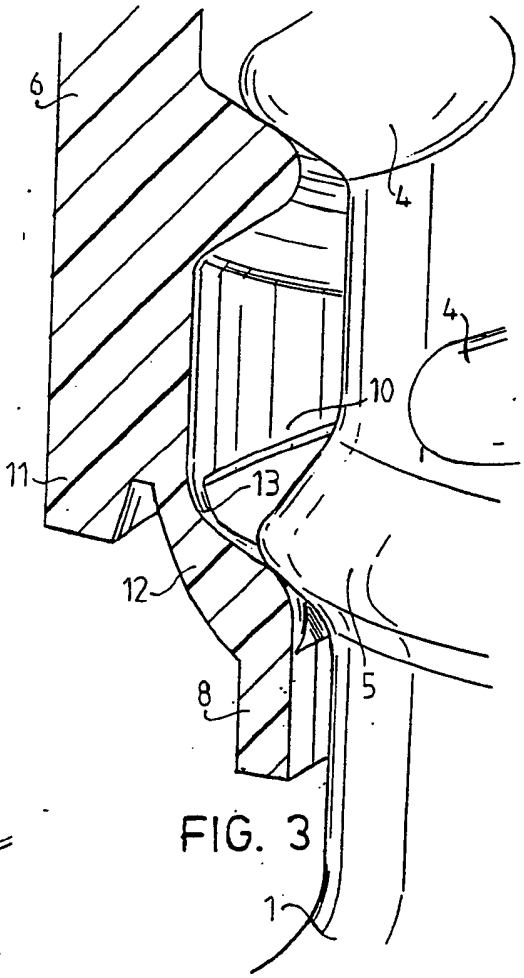

FIG. 3

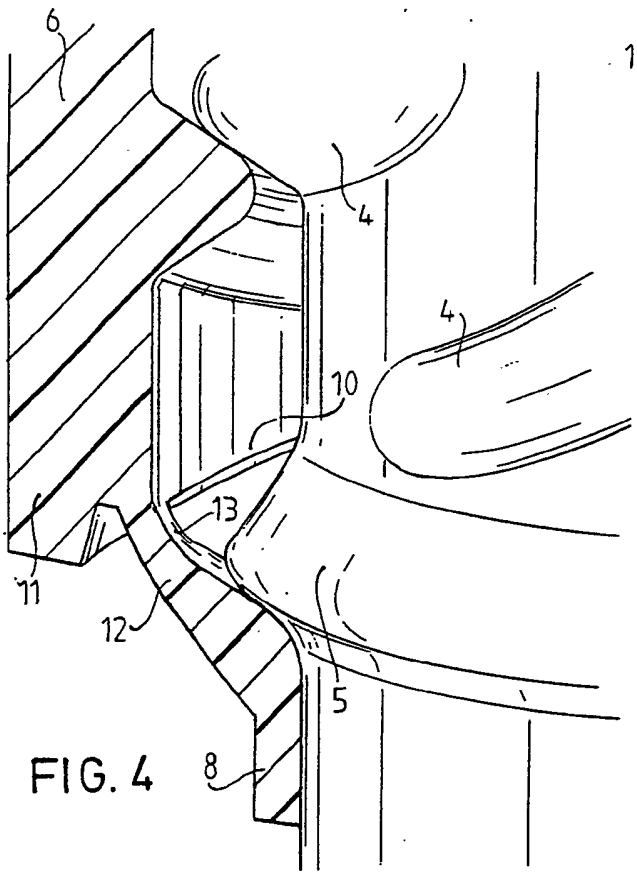

FIG. 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 20 2672

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	GB-A-1 254 930 (CIBA-GEIGY) * Page 2, lines 7-20; page 2, lines 28-49; figures 1-9 * & NL-A-6 904 879	1	B 65 D 41/34
A	AU-A- 531 254 (OWENS-ILLINOIS) * Page 7, lines 3-19; figures 3,4 *	1,2	
A	FR-A-2 421 119 (CAPTOCAP LTD) * Page 2, line 34 - page 3, line 5; page 5, lines 7-14; figures 1-4 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 65 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	10-01-1990	BERRINGTON N.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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